Pragmatic Sustainability

Dispositions for critical adaptation

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Chapter 1

The many meanings of sustainability

A competing paradigms approach

Paul B. Thompson

The fact that sustainability occasions disagreement can hardly have escaped the notice of anyone. The word *sustainability* was so infrequently used before the year 2000 that it did not appear in the spelling guides supplied with word processing programs for personal computers. Yet by 2010 sustainability was everywhere. To be sure, attempts to define *sustainability* were widely regarded as a fool's errand. The common wisdom held that while important social and environmental agendas could be advanced under the umbrella of sustainability, discussion aimed to specify or clarify its meaning would end in confusion, disagreement, and futility. "Just do it" was the motto of the day, and indeed, pursuing sustainability has spawned many useful efforts to change policy and conduct in business, local, and regional government, resource management, economic development, and international relations. Yet contrary to the seeming success of *not* talking about sustainability, this chapter will argue that it is now time to visit the question of just what sustainability means.

In fact, a spate of recent authors have argued that we should now move "beyond sustainability." The phrase occurs in the title of André Edwards' 2010 book, whose subtitle promises "Pathways to a Resilient Society" (Edwards, 2010). Andrew Zolli describes sustainability as an idea that has "grown long in the tooth," arguing that the new cutting edge for progressive environmental thinking will embrace the concept of resilience, rather than sustainability (Zolli and Healy, 2012). Melinda Benson and Robin Craig (2014) similarly declare "the end of sustainability," noting the failures of the approach outlined by the mid-1980s Brundtland Commission (discussed below). Like Edwards and Zolli they advocate a new focus on resilience. David Orr has likewise joined the chorus of authors calling for emphasis on resilience and a turn away from sustainability. While not abandoning the goal of sustainability governance, a distinguished group of scientists affiliated with *The Resilience Institute* call for a break with the pattern of incremental changes that have characterized environmental reforms made after the formative Stockholm Conference on the Human Environment in 1972 (Biermann et al., 2012).

Do the calls for a turn to resilience represent something new, or do they reiterate themes that have always been present in the discourse of sustainability? This chapter assembles the case for the latter interpretation. Contrary to the claims of Edwards, Zolli, Orr, or Benson and Craig, I will argue that the system level emphasis they now call for has always been seen as crucial to sustainability, at least by some of its most influential and far-seeing proponents. Yet the surge of interest in resilience arguably *does* reflect the price we are now paying for having eschewed a substantive discussion of what sustainability means for so long. To abandon sustainability in favor of resilience will not produce the shift in perspective that these authors want. It will only replicate the confusion and disagreements that have been allowed to persist.

Frustration with key limitations in the dominant discourse of sustainability is also an important theme in Raymond Cole, John Robinson, and Lisa Westerhoff's contribution to this volume (see Chapter 12). Rather than abandoning the word *sustainability*, Cole, Robinson, and Westerhoff call for a new way of thinking about sustainability which they call "regenerative sustainability." As I will note below, there are important similarities between their notion of regenerative sustainability and the resilience approach. However, this chapter aims neither to classify the entire literature of sustainability (a Sisyphean task) nor to argue for, or against, any specific approach. I will call attention to some conceptual, logical, and normative patterns that can be observed within this discourse, and argue that the construct of "competing paradigms" is a helpful way to comprehend some (but not all) of the various ways in which sustainability has been understood within different disciplines and domains of practice.

The divided discourse of sustainability: a prolegomena

I will defend the idea of sustainability in response to its detractors and deserters. As Cole, Robinson, and Westerhoff note in their chapter, there are reasons to think that sustainability is emerging as an "essentially contested concept." As developed by the historian of philosophy W. B. Gallie, such concepts are cultural milestones because the debate over them serves to drive innovations in ideology, in social practice, and even in scientific method (Gallie, 1955–1956). As I have written elsewhere, scholars and scientists at work on sustainability should draw inspiration from debates over other essentially contested concepts. Thomas Jefferson and John Adams had rather different ways of understanding the concept of democracy, for example, but we can be thankful that they did not choose to "resolve" their differences simply by choosing different words to communicate their respective views (Thompson, 2012). Our ability to learn from one another and our progress toward collective development of more sophisticated ways of addressing unsustainable practices will be advanced more rapidly if we accept the fact that philosophical differences account for at least some of the diversity in the way that the idea of sustainability is currently deployed.

The view of hierarchically nested systems that is central to the Resilience Institute's approach to sustainability is not shared by everyone. This chapter will argue that much of what is important about the contested nature of sustainability can be articulated as a competition between two distinct paradigms. Stated succinctly, one paradigm follows on the definition of sustainable development formulated by the World Commission on Environment and Development (WCED) in 1987: "sustainable development meets the needs of the present without compromising the ability of future generations to meet their needs." The WCED (popularly known as "the Brundtland Commission" after its chair, Gro Harlem Brundtland) had been charged with the task of formulating a broad outline for global economic development in light of two seemingly incompatible realities. On the one hand, environmental limits on economic activity were becoming evident even in the 1980s as depletion of nonrenewable resources (such as fossil fuels and precious minerals) and the pollution of air and water had become impossible to ignore. These constraints have only grown more ominous as industrial civilization's impact on climate has become better understood. On the other hand, the inequalities between industrialized and less-developed nations were (and remain) equally impossible to ignore. The Brundtland Commission established a paradigm for inquiry into the way that the global stock of natural resources and the Earth's ability to deliver crucial ecosystem services set fixed boundaries on those human activities that can be said to be "sustainable."

The alternative paradigm *is* the one being called into being by those who advocate resilience, and quite possibly by Cole, Robinson, and Westerhoff, as well. But this alternative paradigm has precedents. While the WCED saw development (understood as economic growth) as the process that needed to be sustained, skeptics in many quarters questioned whether sustained growth would disrupt the operation of key ecological and social systems. Long before the WCED, critics of industrial agriculture had been calling for *sustainable agriculture* as a way to emphasize the systemic reproduction of nonrenewable resources such as soil fertility and nutrients, biodiversity including scarce genetic resources, and the institutions of rural communities—the farms, schools, and business or service sectors of small towns. At least in these quarters, sustainability was being threatened less by *constraints* on economic growth than by the way that economic and political institutions create incentives for farmers to ignore their obvious dependence on the systems that reproduce a biological and social order conducive to farming (Thompson, 2007). By the 1990s, ecologists such as Donald Ludwig, Brian Walker, and C. S. Holling were joining the conversation that had been sparked by the WCED, and formulating a general version of this argument that would apply well beyond the agricultural sector of the economy (Thompson, 2010, pp. 202–203). It was their approach that would eventually emerge as "the resilience paradigm."

But what are paradigms, and how do paradigmatic differences contribute to miscommunication, misunderstanding, and disagreement? The suggestion that competing paradigms were emerging in the debates over sustainability was introduced by Bryan Norton in 1995. Norton argued that Robert Solow, one of the leading theorists of economic growth, was applying the paradigm of neoclassical economics in his influential writings on sustainability, while ecological economists were gravitating toward an alternative paradigm based on hierarchy theory in ecology (Norton, 1995). In advancing the thesis that we *should not* abandon sustainability for resilience, getting clear on paradigms is an important place to start. After a brief tutorial in paradigms and a short foray into indicators, the chapter revisits each of the two approaches outlined briefly above. Only then can the case for placing these paradigms into dialog and debate be made on properly pragmatic grounds.

Definitions and paradigms

There were good reasons to eschew the attempt to define sustainability back in the 1990s, but they derive from the nature of definitions, rather than sustainability. Bringing out the dictionary can indeed settle a few disputes among friends, but when disagreement is deep and wide-ranging the strategy of seeking victory by appeal to the conventional meaning of a word is among the most pedantic and ultimately futile. Gallie's notion of an "essentially contested concept" was intended to highlight the sense in which debates over the nature of causality, freedom of the will, and the standard of justice are *not* definitional disputes. Cole, Robinson, and Westerhoff are arguing that we should view sustainability in similar terms.

Significantly, scientists are socialized into a practice of stipulative definition as a key element of technical communication. In scientific articles and presentations, recitation of a concise definitional statement is intended to specify how a term will be used. The practice facilitates communication among even those who might use a somewhat different specification when taking their own turn as a scientific author. But when one scientist's stipulative definition seems totally at odds with another's, there may be no ground on which any meaningful form of technical communication can proceed. One scientist's formulations or results will simply be meaningless and, at best, irrelevant to the problems being researched or analyzed by the other. This kind of definitional impasse may indicate the presence of competing paradigms. When the impasse rises to the level of competing literatures and worldviews, there is reason to talk of essentially contested concepts.

The term *paradigm* is used here in the sense pioneered by Thomas Kuhn. A paradigm is a thought pattern that characterizes and determines what constitutes a legitimate contribution to a scientific field of study. Paradigms may include theories, patterns of explanation, methods for collection, or analysis of data and standards for publication of results. Kuhn's study of "the Copernican revolution" in astronomy was intended to advance several related ideas in the history and philosophy of science. Of most importance to Kuhn himself was the claim that important changes in the sciences *do not* occur through incremental conjectures and refutations, as had been argued by Karl Popper. The transition from the Ptolemaic model of the solar system—with Earth at the center—to the Copernican model in which Earth along with other planets orbit the sun was revolutionary, and had to happen "all at once." Indeed, astronomers such as Tycho Brahe (1546–1601) had been able to reconcile very accurate empirical astronomical observations with the Ptolemaic model by postulating epicycles in the orbit of planetary bodies around a stationary Earth. These epicycles had high predictive value, and were far from being falsifiable in the manner that had been suggested by Popper (Kuhn, 1959).

Kuhn's analysis of Brahe was also intended to illustrate the way in which working scientists fit observations and predictions into formulae that preserved conceptual commitments to a pre-existing conceptual scheme. Paradigms influence perceptual habits. The Ptolemaic astronomer looks out on the horizon at the end of the day and sees the Sun going down (orbiting around the Earth), while the Copernican astronomer sees the horizon moving up as the Earth rotates in relation to the fixed point of the Sun.

Paradigms may also involve extra-scientific value judgments and cognitive commitments. In the case of astronomy, Galileo Galilei's commitment to heliocentrism precipitated his well-known conflicts with the Roman Catholic Church, which held that geocentrism was dictated by scriptural authority. More broadly, the metaphor of claiming that one thing or another is "at the center of things" indicates the way in which a paradigmatic commitment to theories or explanatory forms can be interlinked with ethical and political commitments. In the case of sustainability, some have argued against anthropocentrism, or the view that all prescriptions or policy recommendations must reflect ethical values that prioritize the human species. In contrast, they have argued for biocentrism, which finds value in any living thing, or ecocentrism, which sees value in the integrity of extra-individual entities such as breeding populations, species, ecosystems, or the planetary ecosystem of the Earth itself.

In the case of both theoretical controversies among astronomers and in value-oriented conflicts over the status of humans and nonhumans, paradigms do much to explain persistent patterns of disagreement. An individual's commitment to paradigmatic ways of thinking may reflect widely held and seldom-examined postulates or assumptions. Such shared cognitive commitments support communication and collaboration within a community of practice, but individuals may accept the truth of shared assumptions and the validity of their further implications with little evidence beyond the fact that doing so facilitates their research activity. In the present context, it is important to emphasize how Kuhn's treatment of paradigms reflects the epistemological orientation of pragmatism. In 1913 Josiah Royce drew upon the thought of Charles Sanders Peirce to illustrate how data collection and the formulation of hypotheses in the science rely on "leading ideas." Leading ideas for Royce are subject to falsification and abandonment, but unlike a hypothesis that is tested directly by experimental observations, a leading idea is used as a guide,

> a regulative principle of your research, even though you do not in general intend directly to test it by your present scientific work. It is usually of too general a nature to be tested by the means at the disposal of your special investigation. Yet it does determine the direction of your labors, and may be highly momentous for you.
>
> (Royce, 1913, p. 581)

Royce goes on to illustrate leading ideas through the examples such as the contrast between Euclidian and Riemannian geometry and Rudolf Virchow's understanding of disease as a function of vital organic processes proceeding under altered conditions. Although Kuhn himself made no strong association between paradigms and the doctrines of Peirce or Royce, his development and deployment of paradigms as an explanatory device for disagreement and change was deeply reflective of late nineteenth and early twentieth century pragmatism.

To conclude this section, standard definitional practice in the sciences will neither surface the existence of paradigmatic differences—of incompatible leading ideas—nor does it possess the philosophical depth to resolve such differences when they do become obvious. As noted, the practice in both sustainability science and in policy settings has been to avoid the kind of philosophical discussion and debate that *would* at least clarify the sense in which people are operating within different paradigms. At the same time, it is not clear that conceptual debates of only a few decades have risen to the level of essentially contested concepts. Sometimes—as in the case of astronomy—paradigmatic debates get resolved. With this as a background, the two key paradigms for sustainability can be explored in depth.

The Brundtland paradigm

The WCED report of 1987 gave the world its most frequently cited formulation of sustainability: meeting the needs of the present without compromising future generations' ability to meet their own needs. As Bryan Norton (2015, p. 28) and the Resilience Institute group (Biermann et al., 2012) point out, many of the key ideas in the Brundtland report surfaced at a 1972 conference in Stockholm. We might easily push the formative period for this conception of sustainability back another decade by noticing the influence of *Scarcity and Growth: The Economics of Natural Resource Availability*, by Harold J. Barnett and Chandler Morse, published in 1962. Barnett and Morse offered a way to think about the way that dwindling supplies of nonrenewable resources (minerals and fossil fuels, especially) and damage to renewable resources through pollution and over-utilization would resonate through the broader economy. However, Barnett and Morse's approach has even older roots that go back to the Great Depression of the 1930s, and specifically to a project commissioned by the Franklin D. Roosevelt administration.

When Roosevelt assumed office as President of the United States in 1933 it was manifestly clear that "the needs of the present" were not being met, yet there were no clear *measures* by which the health of the national economy could be gauged. In response, Simon Kuznets developed a system of national accounts that divided the national economy into sectors: mining, manufacturing, agriculture, and the like. In Kuznets' approach, each sector's contribution to the overall national economy is taken to be the sum of value added by production in that sector. This sum can be understood as a "stock" that is determined by inflows and outflows. It is increased by the sale of goods from that sector, but decreased by the sector's purchase of materials (including labor) needed for the production process. When each sector is represented in a matrix format, these stock and flow relationships among various sectors yield a system of equations that can be used to calculate the net contribution of value for the economy as a whole. The stunning result is a number (in fact *the* number) that is now widely taken to serve as an overall indicator of economic health: Gross Domestic Product (GDP). Although Kuznets was careful to point out that it would be extremely misleading to think of this number as a measure of overall social welfare, economic planners came to see sustainability in terms of quarter to quarter growth in GDP long before they started to use the word *sustainability*.

Barnett and Morse followed Kuznets' general approach by examining how scarcity in natural resources would affect inflows and outflows for each sector of the economy. The initial expectation was that as nonrenewable resources were depleted, they would become more expensive with subsequent negative impacts on productivity adumbrating through the economy. To the surprise of many environmentally oriented economists, the higher cost of increasingly scarce resources triggered compensating substitutions that significantly dampened overall impact on GDP. More serious problems were associated with resources such as fertile soil, clean water, or (as we now know) a stable climate. These goods are not traded in any conventional sense, so the cumulative impact of damage to them would not be registered in the form of increased costs. This way of thinking contributed to economists' strategy of trying to find ways for environmental impact to be more effectively reflected in the costs being paid by those who use (or misuse) natural resources. The thought that people will economize on scarce or costly inputs is the driving idea behind "market approaches" to increasing the sustainability of productive activities (Barnett and Morse, 1962).

More generally, however, an approach based on GDP is inherently tied to an accounting mentality. A practice or process will be sustainable to the extent that the resources needed to carry it out are foreseeably available. Barnett and Morse recognized that for a process as broadly defined as "economic growth," the ability to continue it indefinitely can be achieved in many ways: increasing the efficiency of a production process, or shifting from relatively scarce to relatively plentiful resources. Furthermore, while the roots of this approach are in economics, it can be applied to other goods, as well. By the 1970s, matrix models for predator–prey relationships and for energy flows in ecosystems were using the same general quantitative approach that Kuznets had applied in developing national income accounts. As Kuznets had modeled the economy through a complex linkage of stocks and flows, ecologists such as Bernard Patten were modeling biodiversity and ecosystem health in very similar ways (Patten, 1971). If it is the number of organisms (or species, or trophic flows) existing in an ecosystem that matter for conservation, accounting for the key stocks and flows in a manner much like Kuznets devised for a national economy can be a quantitatively sophisticated way to understand how well an ecosystem is faring. In other work I have called this a *resource sufficiency* understanding of sustainability.

There are, of course, many things to debate within this paradigmatic way of approaching sustainability. One might start with Kuznets' warning about GDP. There are many bad things that contribute to economic growth. When people pay doctor and hospital bills for treatment of diabetes or heart disease, it is a positive flow into the healthcare sector of the economy. The profits of oil companies boost GDP, even while combustion of their product pollutes the atmosphere. When we make defensive expenditures to develop new weapons systems they register as contributions to the economy in numerous sectors: research and development, education, and manufacturing. Even paying to clean up toxic spills makes a positive contribution to GDP. Yet it is far from clear that we want to think of all these types of economic activity as making our society more sustainable. The critique of GDP was a centerpiece in Herman Daly's writings on sustainability (Daly and Cobb, 1989; Daly, 2005).

It is crucial to see that these debates take place *within* the accounting approach implied by the Brundtland paradigm. They are debates about what to count and how to count it. They do not challenge the basic idea that meeting the needs of the present (without compromising future generations' ability to meet their own needs) is primarily a problem of resource sufficiency. It is primarily about ensuring that the resources needed to ensure that key goods can be produced or reproduced will be able to continue, and it construes the ability to continue largely in terms of maintaining the inflow for whatever stock (economic activity, biodiversity) has been chosen as the target for sustainable management practice. People who share a commitment to this overall understanding of sustainability as such may nonetheless disagree sharply about *which* stocks really matter: is it economic activity, or is it biodiversity? What they agree on is that the complex systems models that are used to calculate stocks and flows are tools for getting a better grip on how much of the key stock (however they conceptualize *that*) will be available.

The resilience paradigm

But systems thinking can also yield an entirely different kind of understanding. The same year as the Stockholm conference alluded to above, *Limits to Growth* was released with lead authorship attributed to Donella Meadows. In one sense, *Limits to Growth* looked rather much like an update for Barnett and Morse. It provided a complex systems model linking sectors of the industrial economy to various processes of resource exhaustion and damage to ecosystem services. Even its title suggested a similar orientation: identifying how increasing scarcity of inputs to various production processes would eventually constrain the quarter to quarter growth in GDP that had come to symbolize a healthy economy. But as Meadows made clear in later publications, the significance of the systems modeling done for this project lay not in the absolute numbers generated for future economic activity (or for stocks of natural resources such as fossil fuels or biodiversity). Rather, the point was to illustrate how the feedback relationships that were governing stock and flow relationships were themselves unstable. The system model had a structural flaw. Whether generated by declines in top predators or by economic incentives, the stocks and flows crucial to economic growth would inevitably lead to unstable oscillations, to overshoot (as rates of consumption or population growth are stimulated by temporary feedbacks) and finally to total system collapse. While it might not be clear *when* this would happen, it was the overall structure of the system that was at the root of humanity's predicament. The system itself was unsustainable (Meadows, 2008).

Limits to Growth was built upon an exceedingly complicated systems model, but elsewhere ecologists were building on the modeling techniques being promulgated by Patten to develop a repertoire of systemic interactions, some of which produce surprising patterns of behavior, while others lead to catastrophic failure and system collapse. Ecological models exploring the relationship between stocking rates for livestock, grasses, and woody plants showed that for some configurations of these variables, a savanna ecosystem could potentially return to previous levels of biological productivity even after periods of drought or flooding (e.g., resilience), while other configurations would lead to stable ecological states with lower overall productivity (Walker et al., 1981). Other models including human decision making showed that decision makers using highly simplified mental models could outperform decision makers attempting to optimize performance, even when equipped with total knowledge of ecosystem functions (Grant and Thompson, 1997). In this kind of system modeling, the point was to identify structural features that affect overall system functioning.

System structure was also crucial in many engineering applications. A robotic control assembly, an information processor, or the infrastructure for electrical power distribution need to function under the actual environmental conditions in which they operate. A robotic assembly structure that vibrates as it moves can generate oscillating feedback that eventually shakes the entire thing apart. An electrical grid that can be taken down by a simple thunderstorm is too vulnerable to external perturbation. In the former case, the system is susceptible to collapse from an internally produced feedback, while in the latter case it is exposed to externally imposed disruption. In either case, the system in question is *fragile*, and an engineer must take such weaknesses into account in the design process. In short, engineered systems must be *robust*: they must resist both internal and external sources of failure.

But robustness is not everything. Contemporary information processing systems have been designed to recover from minor errors—an instruction to search for some missing bit of code, for example—and electric grids are designed to reset and restore power quickly when a lightning bolt or a falling limb disables a power line or substation. Such systems are designed to be *resilient*. They recover essential functions after momentary or episodic perturbation. Relatively few mechanically engineered systems were designed to be *adaptive*, to respond to changes in their environing conditions with modifications in system design and that maintain overall functionality. Yet system designs that include human operators within the system boundaries can have this feature, and an adaptive learning capacity is increasingly being seen as a desirable feature of computerized control systems. A system that is highly robust, resilient, and adaptive can maintain its functional integrity.

It is useful to relate robustness, resilience, and adaptive capacity to engineered systems because it is easy to see how these system-level goals are distinct from whatever goods the systems were intended to deliver in the first place: a manufactured good in the case of a robotic assembly system, a control procedure in the case of an information processor, or electric power in the case of the grid. The goods produced or delivered by such engineered systems are the desiderata that led engineers to design and build them in the first place, but once in place a new set of systemic objectives emerge reflecting the integrity with which system components have been assembled and interact with the system's external environment. A hospital with a gasoline-powered generator may be able to sustain patient services even if the power grid goes down and stays down (e.g., is not resilient). The hospital is sustainable in a resource sufficiency sense because it can secure the power resources it needs to deliver services through switching to an alternative source. But the grid itself has clearly failed to be sustainable in a functional integrity sense.

But what if we were to think of the hospital itself in systems terms? Here, we would include both its connections to the power grid and its back-up generator as system components. We might then say that as a system, the hospital has been made more sustainable (more resilient) because it has the capacity to restore functions even when one system component (the power it typically gets from the utility company) is disrupted. Notice that in thinking of the hospital this way, we are no longer talking about the underlying capacity of the hospital to deliver health services. It is not as if switching to back-up power gives the hospital more resources to produce healthcare (it is, in fact, probably less capable). But including a back-up generator in the hospital's overall system design makes it more sustainable in the sense that it is more robust, resilient, and has greater adaptive capacity. When viewed as a system, the hospital has greater ability to maintain its functional integrity. The turn toward thinking of buildings and infrastructure in such terms has been characterized as "regenerative thinking" (Svec, Berkebile, and Todd, 2012).

The hospital example shows how functional integrity becomes apparent through a perspectival shift. It is often possible to take a systems perspective on an object or set of practices that might more typically be conceptualized purely in terms of the particular goods and services that the object or practices produce. In making this shift, one can articulate features of the system that are intrinsically valuable for the system's integrity and ability to function, but that may be less apparent when one is viewing the object or practice strictly in terms of its instrumental value for producing certain goods. This perspectival dimension is characteristic of a paradigm shift. As the Copernican astronomer looks out at sundown and sees the horizon moving up, a systems perspective shifts the attention from specific goods being delivered (healthcare, in the case of our hospital) to those systemic features that confer sustainability in the sense of resistance to internal or external threats that can cause the system itself to collapse.

Sustainability ethics

Although authors writing on sustainability routinely acknowledge the importance of ethics, they rarely appreciate the sense in which sustainability ethics depends mightily on one's paradigmatic orientation to the problems of sustainability. For example, Simon Dresner's *Principles of Sustainability* includes an insightful discussion of key ethical questions arising in response to the Brundtland Commission's report. The WCED had been commissioned to study how the kind of resource-constraint problems discussed at the 1972 Stockholm conference translate into a program for economic development on a global basis. The global situation in the 1980s was characterized by dramatic inequalities in the level of industrialization and concomitant standards of living (as it remains today). The ethical problem for anyone adopting the perspective of resource sufficiency is "enough for what and for whom"? Is it ethical for already developed nations to consume a disproportionate share of scarce natural resources, while people in less developed parts of the world are required to limit their consumption? Dresner interprets sustainability ethics as a problem of distributive justice, complicated not only by the inequality existing between people in greater and lesser industrial countries today, but also in terms of the sufficiency of resources for generations to come (Dresner, 2008). The basic problem has only become more dramatic in the era of climate change, as people in the richer North have built their quality of life on decades of emitting copious quantities of greenhouse gasses into the atmosphere. It cannot be fair to now insist that people less well-off must bear the burden of limiting further emissions by constraining their own industries (Shue, 1993).

As ethically compelling as these arguments might be, they do not articulate the values that emerge when one's focus is directed to the functional integrity of the global ecosystem, itself. The resilience paradigm understands sustainability in terms of the robustness and resilience of this system. Authors representing the Resilience Institute have been advocating observance of key planetary boundaries that must not be breached if the global ecosystem is to provide "a safe operating space for humanity." Among the boundaries under imminent threat are the global climate system and biodiversity (Rockström et al., 2009). It would be misleading to say that the ethical imperatives that are derived from these boundaries have nothing to do with the standard of living enjoyed by rich and poor, for the overall thrust of the Resilience Institute message is to warn humanity of the impending danger to the very ecological processes that make life as we know it possible. *No* standard of living will be sustainable (in a resource sufficiency sense) if the global ecosystem goes into a state of general collapse. Nevertheless, in directing attention to the overall functioning of ecosystem processes, the resilience perspective is asserting that the integrity of this system transcends, overrides, or trumps the imperatives of distributive justice. It would be difficult to see how this claim could be ethically justified apart from the manner in which a systems perspective reveals the importance of robust, resilient, and adaptive capabilities.

The shift between a distributive justice ethic that arises in connection with resource sufficiency and the systems ethic that emerges in a resilience paradigm will also vary depending on whether one is taking a truly global perspective or not. Much of the policy directed toward sustainability has been directed at urban and regional scales, as managers and civic groups aim to produce sustainable cities (Moore, 2007). Here, too, the perspective shift between the Brundtland and resilience paradigms will be meaningful. Here, too, resource sufficiency has been the dominant perspective. Sustainability has been conceptualized in terms of a municipality's ability to deliver key social services, while also enjoying the kind of economic growth that provides a steady source of employment for its population. In this context, sustainability ethics has often been associated with the third dimension of the familiar heuristic device that represents sustainability in terms of economic, environmental, and social domains. "Social sustainability" is concerned with the various dimensions of distributive justice: Are the burdens and rewards of economic activity distributed fairly? Are any groups being excluded from decision making? Are opportunities for key goods such as healthcare and education available to all?

At the level of a municipality, the trump value of maintaining overall systemic integrity may be less compelling than ensuring fair distribution of resources and finished goods. Yet taking the systems perspective on a city can reveal otherwise nonobvious dimensions of sustainability. Cities depend on public finance to operate their police departments and fire stations. Cities must maintain the integrity of the system that generates their financial resources in order to do anything for anyone. Studies of public finance in Detroit reveal how the city failed to revamp its system for levying and collecting taxes on real estate as population declined and many homes or businesses were abandoned. By carrying assets that would never be collected on its books for many years, the city deepened its financial crisis. The problem here was not really one of resource sufficiency (though one can treat tax revenue as a stock influenced by the outflow of taxpayers). Rather it was a financial system with virtually no adaptive capability to respond to ongoing changes in its operating environment (Reese, Sands, and Skidmore, 2014). The systems perspective reveals that there are respects in which cities themselves must be robust, resilient, and adaptive in order to remain sustainable. As with Johan Rockström's advocacy of a "safe living space" for planet Earth, the ability of city to deliver the goods and services that are the subject of distributive justice will depend on maintaining the integrity of its systemic operations.

There is thus a sense in which sustainability ethics should be conceptualized as an inquiry into *which* perspective, which paradigm, is most perspicacious for articulating the values and imperatives most relevant to the problem at hand. Sustainability problems are wicked problems in the sense that there is often no definitive definition of what the problem is, there are multiple interests and perspectives bearing on any proposed tack, scientific uncertainties are pervasive, decision making will have irreversible consequences, and the costs of getting it wrong are high. The fact that sustainability is paradigmatically conceptualized according to sometimes contrasting, sometimes complementary paradigms only complicates this problem. And it should be conceded at this juncture that some parties contending for particular approaches to sustainability may be approaching the idea with no particular paradigm in mind, at all. They equate sustainability with all things good, and presume that anything they don't like is automatically unsustainable. The ability to shift from a resource sufficiency take on sustainability, with its emphasis on distributive justice, to a systems perspective, with its emphasis on the robustness, resilience, and adaptation of the system itself may prove helpful to a planner or citizen attempting to negotiate the multiple strands of wickedness. As Bryan Norton has written, it is here that the pluralistic dimensions of pragmatist ethics become essential (Norton, 2015, pp. 113–142).

Next steps toward sustainable cities

Is it time to move "beyond sustainability," to embrace resilience? In suggesting that sustainability has always been informed by two competing paradigms, I effectively answer that question in the negative. Advocates of resilience have become deeply frustrated at the way that partial responses and strategies for increasing the efficiency of processes that utilize environmental goods have dominated the public discourse on sustainability. They have good reason for their frustration, as this emphasis on conserving scarce resources and substituting more plentiful ones has arguably obscured systemic vulnerabilities. Yet a total shift to the resilience paradigm might well obscure the imperatives of distributive justice, as one drives to preserve systems that may be failing to serve segments of the populace in a structural manner. There may be no element in contemporary socioeconomic systems that is *more* resilient than structural racism, but we should not regard that as a good thing. In fact what is needed now is the ability to glimpse *both* paradigms, to place resource sufficiency and functional integrity into dialog with one another.

Although it is futile and counterproductive to settle debates over sustainability through an exercise in definition giving, it may now be time to open our minds to a more substantive conversation about what sustainability means. Cole, Robinson, and Westerhoff's regenerative sustainability can be read with such a reinvigorated and substantive conversation in view. In their contribution to this volume, they suggest that *resilience* is too closely tied to a conception of the exact sciences that relies on the indefensible assumption that facts and values can be strongly separated. They appeal to relatively recent work in social studies of science that emphasizes the role of social construction in support of the regenerative alternative. However, one of the reasons to advance a *pragmatic* orientation to sustainability is that pragmatists have *always* worked from a social epistemology that emphasizes a functional approach to meaning, a community of inquirers, and the performativity of communicative practice (Churchman and Ackoff, 1950). Anyone who identifies with pragmatism will be in agreement with Cole, Robinson, and Westerhoff on matters of method and basic epistemology.

On a more positive note, Cole, Robinson, and Westerhoff suggest that the word "regenerative" connotes a shift away from simply limiting the impact of human activity on ecosystem functions, and toward the idea that architecture, civil engineering, and urban infrastructure can themselves be seen as part of a functional socio-ecosystem that needs to be sustained. Their approach envisions the design process as being abetted by a more integrated conceptualization of the natural and the cultural, one that recognizes the way in which norms and institutions are inevitably reinforced by the built environment in which human beings work, reside, and engage in leisure activity. Since reinforcement of habitual (and largely unreflective) practice is an inevitable side-effect of the built environment, it behooves designers to consider how aspects of their work can encourage habitual practices that are more constitutive of a social order that will produce and reproduce just practices, as well as more conventional ecosystem services (Cole, Oliver, and Robinson, 2013).

I myself once made a similar recommendation of the word "regenerative" in connection with sustainable agriculture (Madden and Thompson, 1987). It did not, in fact, catch on. Instead there has been a continuous give and take of how we should understand sustainability in the domain of agriculture (Thompson, 2007). The preference for the adjective "regenerative" in connection with urban systems may well suffer a similar fate. It is worth noting that while in the contribution to this volume Cole, Robinson, and Westerhoff write of "regenerative sustainability," while in other contexts it is "regenerative design" (Cole, Oliver, and Robinson, 2013) or "regenerative thinking" (Svec, Berkbile, and Todd, 2012). Without wishing to impugn the substance of their program, my assessment is that Cole, Robinson, and Westerhoff are leaning toward a resilience paradigm, but leery of the possibility that biologically trained scientists will take it as a cue to ignore the social dimension. They are, in effect, hoping that the word *regenerative* will signal what this chapter refers to as *ethics*.

The grammar of sustainability has proven to be a fruitful umbrella for moving various environmental and planning efforts forward. In many cities sustainability has become a banner that diverse groups have found congenial for rare moments of cooperative politics. Neither the debate over sustainability nor efforts to substitute some other term should be permitted to set such efforts back. Nevertheless, a more substantive and constructive discussion of how sustainability has been differently conceptualized can reveal how key values and crucial perspectives may have been overlooked in some of the dominant discourses. Paradigms shape scientific research agendas and determine the methods deemed to be legitimate and valuable for achieving results, but they also shape perception. They reach deeply into nonscientific cultural domains, and shape (as they are shaped by) habits of action in commerce, education, religion, and the arts. Those who have labored under the overly narrow construal implied by the Brundtland paradigm's focus on scarcity and growth may have failed to take the truly systemic perspective of the resilience paradigm. But the resilience paradigm may itself be entirely too capable of overlooking the vulnerabilities of individual human beings, and failing to correct systems that have failed too many for far too long.

We need both paradigms. We need pluralism. And we need a sophisticated pragmatism that acknowledges the generative power of placing competing perspectives into genuine dialog with one another.

For further consideration

Questions

1 What are the fundamental differences between the "resilience paradigm" and the "Brundtland paradigm" of sustainability and how might those values influence city-making differently?
2 Given the two, sometimes conflicting paradigms of sustainability that dominate the field, how can practitioners of sustainability avoid conflict and incoherence?
3 Write a page articulating the reasons why defining a problem before you act to solve it is a good practice. Then, write a second page articulating why acting first is a better practice.
4 What is a "pluralistic" conception of sustainability and why does Thompson, among others, insists it is the preferred concept?
5 The common definition of "sustainability" is resource sufficiency—having the resources. Why does Thompson reject this narrow definition?

A problem

Begin with a concrete problem, say the design of a school or a zoning ordinance. Divide your group into three teams: one will employ the resilience paradigm, another the Brundtland paradigm, and the third team will employ both. At each stage of the project each team will be responsible to articulate how decision making was guided, or conflicted by their adopted paradigm(s) of sustainability. At the conclusion of the project each team must articulate a sustainability paradigm of their own based on the knowledge gained in the design process.

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